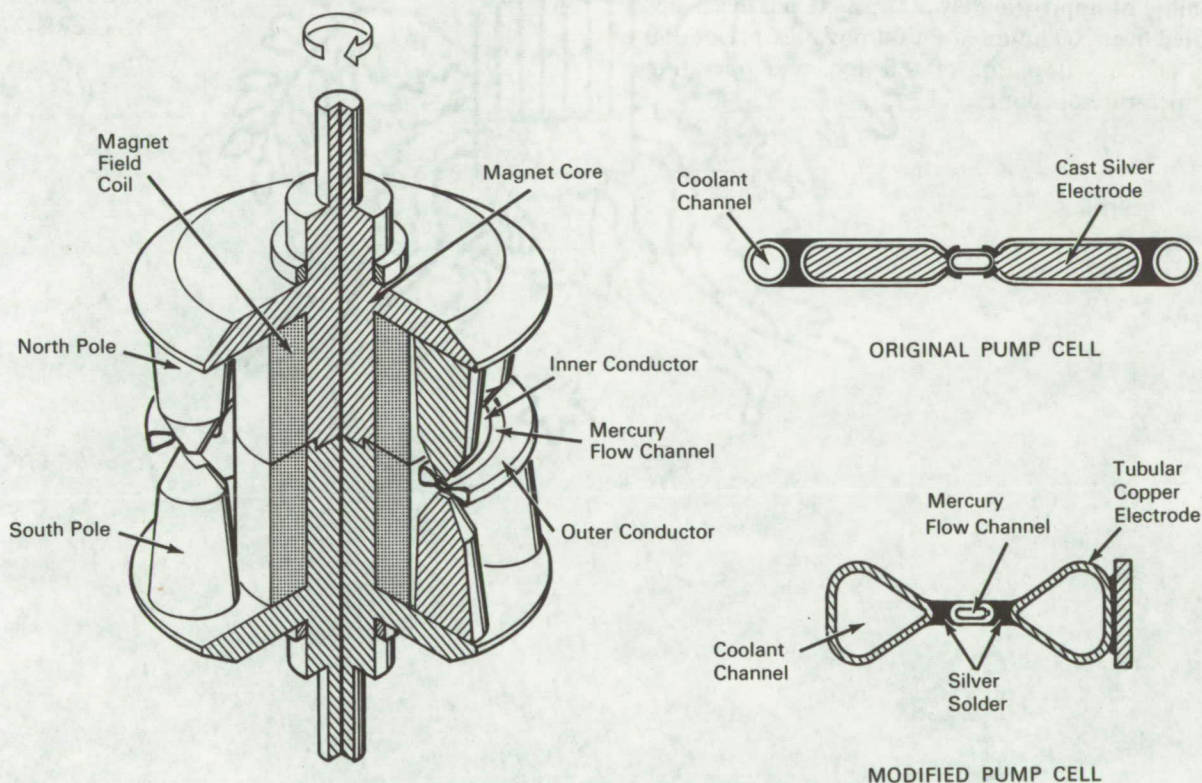


# NASA TECH BRIEF



NASA Tech Briefs are issued to summarize specific innovations derived from the U. S. space program and to encourage their commercial application. Copies are available to the public from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

## Rotating Magnetic Poles Used to Pump Mercury



### The problem:

To modify a rotating magnetic pump, normally used for pumping alkali salts, for efficient pumping of mercury. Prior to modification, pressure development with mercury was very difficult because mercury wetting of the flow channel surface was not readily attained, and induction heating of the mercury formed vapor in the flow channel causing loss of developed pressure due to dewetting.

### The solution:

Redesign of the pump cell resulting in better electrical continuity, more efficient heat removal, and good wetting characteristics in the mercury flow channel.

### How it's done:

The basic modification to the mercury pump consists of replacing cast silver electrodes on each side of the flow channel with tubular nickel-plated copper

(continued overleaf)

conductors silver-soldered to the flow channel. These tubular conductors also carry the pump coolant. The flow channel itself is chemically and thermally conditioned to induce mercury wetting at elevated temperatures. After degreasing, ultrasonic chemical cleaning, and exposure to a 4% sulfuric acid-4% hydrochloric acid solution, the flow channel is evacuated to about  $10^{-4}$  torr. Triple-distilled mercury is then introduced into the flow channel and is thermally cycled between 500° and 900°F at 1 minute intervals for approximately 20 minutes. This thermal cycling consisted of setting the conductor coolant flow rate at a fixed level and then varying the pump field current between 0 and 3 amps as the pump magnet rotated.

**Notes:**

1. This modified pump has developed a pressure capability of approximately 500 psi. It has been operated over 200 hours at an output pressure of 350 psi, mercury flow rate of 150 pph, and operating temperature of 600°F.

2. Further information concerning this innovation is presented in NASA TN D-2965, "Electrodynamic Mercury Pump" by A. Vary, September 1965, available from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151; price \$1.00. Inquiries may also be directed to:

Technology Utilization Officer  
Lewis Research Center  
21000 Brookpark Road  
Cleveland, Ohio 44135  
Reference: B66-10434

**Patent status:**

No patent action is contemplated by NASA.

Source: Alex Vary, Ben T. Ebihara,  
and W. H. Lowdermilk  
(Lewis-276)